Global Scientific JOURNALS

GSJ: Volume 9, Issue 4, April 2021, Online: ISSN 2320-9186
www.globalscientificjournal.com

THE ROLE OF THE CONSTRUCTION INDUSTRY IN ATTAINING THE MILLENNIUM DEVELOPMENT GOALS

IKE Daniel, Okula Harrison

Department of Architecture, Rivers State University, Port Harcourt, Nigeria

Email: daniel.ike@ecampus.rsu.ng

danielsconice@gmail.com

ABSTRACT

Although, there are many under-developed countries in the world, development is a disposition of any society. In the quest to achieved this, many countries joined the United Nations to set up eight time-bound Millennium Development Goals (MDGs) to address poverty, hunger, maternal and child mortality, communicable disease, education, gender inequality, environmental damage and the global partnership. Irrespective of the fact that these goals have not been achieved, many societies are striving hard to achieve them, but has achieved less than more. Nigeria is one of such developing countries. There has been efforts to improve health, education and gender inequalities in the past few years, but less attention has been paid to environmental sustainability. It is obvious that man's activities such as industrialization and modern construction has caused more harm than good to the environment. The question of how this issue can be addressed and what measures should be put in place in order to contain these environmental degradation is somewhat left in the lurch. This research focusses on how the construction industry can help promotes environmental sustainability as the 7th MDG. By so doing, it explains the concept of environmental sustainability, outlines the importance of planning and formulating sustainable design principles and construction approaches that can help the building industry contribute to environmental sustainability.

Keywords: Millennium Development Goals (MDGs); Environmental sustainability; Construction industry; Design and construction.

1.0 INTRODUCTION

On September 2000, some 189 countries of the world collaborated to support the United Nations Millennium declaration in New York, US. This meeting led to the adoption of eight time-bound Millennium Development Goals MDGs. This MDGs is one of such development plans that the world has been looking forward to. The MDGs which focused on human capital, infrastructure and human rights were expected to be achieved by respective nations by or before the year 2015.

These goals are as follow;

1. To minimize extreme poverty and hunger
2. To achieve universal primary education
3. To promote gender equality and empower women
4. To reduce child mortality
5. To improve maternal health
6. To combat HIV/AIDS, malaria and other diseases
7. To ensure environmental sustainability
8. To develop a global partnership for development.

These eight goals have eighteen targets met for tackling poverty, hunger, maternal and child mortality, communicable diseases, education gender, environmental damage, inequality and the global partnership development. Below are the targets for each specific goal;

Goal 1: Eradicate Extreme Poverty and Hunger

Target 1: Reduce by half the proportion of people living on less than a dollar a day.

Target 2: Reduce by half the proportion of people who suffer from hunger.

Goal 2: Achieve Universal Primary Education

Target 3: Ensure that all boys and girls complete a full course of primary schooling

Goal 3: Empower Women and Promote Equality between Women and Men

Target 4: Eliminate gender disparity in primary and secondary education preferably by 2005, and at all levels by 2015

Goal 4: Reduce Under-Five Mortality by Two-thirds

Target 5: Reduce by two thirds the mortality rate among children under five

Goal 5: Reduce Maternal Mortality by Three-quarters

Target 6: Reduce by three quarters the maternal mortality ratio

Goal 6: Reverse the Spread of diseases, especially HIV/AIDs and Malaria.

Target 7: Halt and begin to reverse the spread of HIV/AIDS

Target 8: Halt and begin to reverse the incidence of malaria and other major diseases

Goal 7: Ensure Environmental Sustainability

Target 9: Integrate the principles of sustainable development into country policies and programmes; reverse loss of environmental resources.

Target 10: Reduce by half the proportion of people without sustainable access to safe drinking water.

Target 11: Achieve significant improvement in lives of at least 100 million slum dwellers, by 2020.

Goal 8: Create a Global Partnership for Development, with Targets for Aid, Trade and Debt Relief.

Target 12: Develop further an open, rule-based, predictable, nondiscriminatory.

Target 13. Address the special needs of the least developed countries Includes: tariff and quota free access for least developed countries' exports; enhanced programme of debt relief for HIPCs and cancellation of official bilateral debt; and more generous ODA for countries committed to poverty reduction.

Target 14: Address the special needs of landlocked countries and Small Island developing States.

Target 15: Deal comprehensively with the debt problems of developing countries through national and international measures in order to make debt sustainable in the long term.

Target 16: In cooperation with developing countries, develop and implement strategies for decent and productive work for youth.

Target 17: In cooperation with pharmaceutical companies, provide access to affordable essential drugs in developing countries.

Target 18: In cooperation with the private sector, make available the benefits of new technologies, especially information and communications.

Reports and experiences from many countries have shown that major paths of the Millennium Development Goals has been partially accomplished especially in the Under-developed and some developing countries. However, some countries are striving to achieve the MDGs (Marta L; Bettina B; Ulrich L 2014). Nigeria which is the most populous country in Africa is an example of a developing country among the 189 collaborated nations that joined the UN in the MDGs. Ever since then, the country has been striving but with little success to achieve the goals. In spite of the substantial progression in the economy and advancement in social aspect in the past thirty years, the country still suffers from extreme poverty and have been facing other enormous challenges in the quest of setting up a development agenda. (Kolawole T. et al; 2014).

Successive government regimes through different schemes and programmes has made many attempts aimed at eliminating or

reducing poverty, but these programmes, despite the pure motives and objectives of the initiators have been obscured by corruptive practices. Some of these programs includes; Directorate of Food, Roads and Rural Infrastructures (DFRRI), Food security and Nutritional Network (FSN), and the Poverty Alleviation program. Recent statistics shows that the poverty rate in Nigeria is constantly on the increase. For example, as at 1960, it was estimated that 15% of Nigeria population were poor. That percentage has grown to 28.0% as at 1980, 46.0% in 1985, 60% in 1996 and 70% in 2001. (FOS, 2003; FGN, 2002). Additionally, before the emergence of the MDGs, literacy rate was 44% and almost a quarter of the rural dwellers do not have access to clean water, adequate health care facilities and electricity. But recently, the rate of illiteracy has risen to 30%. (Adedigba, 2017).

Infrastructures which is one of three main aspects of the MDGs requires expertise to been created successfully. Building facilities such as schools, health centers, commercial centers etc, requires the skill of an architect and engineers. Architecture and engineering which are sciences, deals with the design and erection of such facilities to meet users' requirements and values. However, sustainable development has been hampered in the quest to provide these habitable spaces, making it one major obstacle toward efforts in achieving the Millennium Development goals. Building designs and construction practices have altered the well-being of the natural environment. This has resulted to habitat and biodiversity loss, land degradation for Agriculture, climate change and environmental pollution. Raux and Alexander; 2007, observed that building construction and design accounts for half of the carbon (IV) oxide emission worldwide. This is because man has advanced to the use of modern technology such as computer, the use of fossil fuel machines and some toxic building materials.

Environmental sustainability should be a major factor to consider when altering the natural environment. Apparently, this has not been the case, being a major blow to one of the MDGs. Professionals in the building industry (architects, structural engineers etc.) are saddled with the responsibility of creating sustainable building facilities that promotes Environmental sustainability. Promoting Environmental sustainability should be a top priority to these professionals since their activities alters the natural environment. The question of what practices or guiding principles should govern the building industry in the process of creating these facilities has somewhat been a puzzle.

The specific issue of creating sustainable building facility in the environment is clearly seen in both rural and urban areas of the country. Olotuah; 2009, affirmed that incremental in construction of building facility in the rural centers in Nigeria has pervaded the area. Many of such buildings are inhabited with the barest facilities in place. Environmental Sustainability is now a global issue, the position of architecture and engineering in attaining a sustainable environment in both developed and developing countries has not been satisfactory. It may be that the concept of sustainability has been ambiguous to these professionals or building owners. Some who claim to be architects and engineers most times, use devious means of getting architectural and engineering works done. As a result, the environment is left unsafe and unsustainable for habitation.

1.1 Aim and Methodology of the Research

This paper is aimed at promoting Environmental sustainability as a Millennium Development Goal.

The methodological approach to this research is purely literature review of published journal articles, published books, magazines and other resourceful materials.

2.0 LITERATURE REVIEW

2.1 The Concept of Environmental Sustainability

For a clear understanding of what Environmental sustainability is, it would be reasonable to define the words, "Environment" and "Sustainability." From a scientific perspective, "environment" is the total set of surrounding; the ecological complex of physical, chemical and biological factors that act upon an organism, population or an ecological community and ultimately determines its form, functions, and survival. It is the product of a complex of variable factors such as, substances, (water, soil). Forces (wind, gravity), conditions (temperature, light), organisms (plants, animals and microbes) and time. (Biswas & Jayanta, 2018). On the other hand, "sustainability "focuses on meeting the needs of the present without compromising the ability of the future generation to meet their own needs. Therefore, environmental sustainability can be defined as the responsible interaction with the environment to avoid exhaustion or degradation of natural resources and allow for long-term environmental quality. This ensures that the needs of today's population are cared for without jeopardizing the ability of the future generation to care for their needs.

The natural environment has a remarkable ability of rejuvenating itself and sustaining its

viability. This can be seen from the process of decomposition. For example, trees that fall, passes through the process of decomposition and finally enrich the soil's nutrients for the growth of plants. The environment is naturally sustains all forms of life indefinitely and there are systems that maintain human life. (Goodland, 1995) The main reason why humans seek environmental sustainability is to protect not only the present life but also the future generation. Humans depends on non-human species for food, oxygen, shelter, plant pollination, assimilation of wastes and other environmental life-support services. These huge instrumental values of the non-human species should not be underrated

2.2 Causes of Environmental Unsustainability

When the human economic subsystem was small, the reformative and assimilative capacities of the environment appeared endless. We are now painfully learning that environmental sources and sinks are finite. These capacities were very large, but the scale of the human economy has exceeded them. Source and sink capacities have now become limited. Conventional economists still hope or claim that economic growth is infinite or at least that we are not yet reaching limits to growth; hence the fierce recent repudiation of Beyond the Limits of Growth (Randers & Meadow, 1992). The scale of the human economy is a function of throughput-the flow of materials and energy from the sources of the environment, used by the human economy, and then returned to environmental sinks as waste. Through-put growth is a function of population growth and consumption. Through-put growth interprets into increased rates of resource extraction and pollution (use of sources and sinks). The scale of throughput has exceeded environmental capacities: That is the definition of unsustainability. There is little admission yet that consumption above sufficiency is not an unmitigated good. The scale of the human economy has become unsustainable because it is living off inherited and finite capital (e.g. fossil fuels, fossil water); because we do not account for losses of natural capital (e.g. extinctions of species), nor do we admit the costs of environmental harm. The second reason for unsustainability is related to the first: government failure to admit that pollution and fast population growth are doing more harm than good. In the last few decades, various types of pollutants have appeared due to anthropogenic activities, adversely affecting the ecosystems (Rockström et al. 2018). Environmental risk factors mainly due to air pollution and non-communicable diseases are driving up health

care costs, which consume nearly 10% of global gross domestic product (GDP) (WHO http://apps.who.int/nha/datab ase 2017)

Each year a wide range of pollutants are released in the environment through industrial emissions. The data reveals that more than 1,40,000 new chemicals and pesticides have been synthesized since 1950 (Landrigan et al. 2017) and only a very few of them like; polychlorinated biphenyls (PCBs), dichlorodiphenyltrichloroethane (DDT), polyethylene, hydro chlorofluorocarbons (HCFCs) and chlorofluorocarbons (CFCs) have been critically assessed for toxicity. Role of CFCs in ozone layer depletion is very well known. Thankfully, CFCs causing trouble in the ozone layer were expelled by the Montreal protocol. (https://www.nasa.gov2018). However, in the last few years, research on ozone depletion revealed thinning in the lower stratosphere over the non-polar areas (Hansen 2018). Researchers now suspect the role of chemicals used in paint industries to be responsible for ozone depletion in non-polar regions (Carrington 2018). Fossil fuel consumption for supply of energy demand of globe is very high and it is one of the major reasons of air pollution and global warming which is discussed in subsequent sections.

2.3 The Time for Environmental Sustainability

Approaching sustainability is urgent. Consider that if release were halted today of all substances that damage the ozone shield, the ozone shield may need as much as one century to return to pre-CFC effectiveness. Every passing year means sustainability has to be achieved for an additional 100 million people. Though environmental sources and sinks have been providing humanity with their services for the last million years, and until recently have seemed vast and resilient, we have at last begun to exceed them and to damage them worldwide. Where environmental services are substitutable, the substitution achieved has been marginal. Most natural capital or environmental services cannot be substituted for, and their self-regenerating properties are slow and cannot be significantly hastened. That is why environmental sustainability has a time urgency.

Much of the resistance to accepting the necessity of a sustainability approach is that politicians have considered the consequences of doing so-controlling consumerism and waste, halting human population growth, and probably reducing population size, and relying on renewable energy-to be politically unacceptable. These are all felt to be

politically damaging, so they are not put forward as much-needed societal goals. Instead, society calls for incremental progress in such disparate areas as enforcing the 'polluter pays' principle, support of women's reproductive health, educating girls, or clean technology. Important though these goals are, they are not enough, yet no one calls for the redistribution of resources from rich to poor. It is impossible for us to grow out of poverty and environmental degradation. It is precisely the non-sustainability of throughput growth beyond a certain scale that gives urgency to the concept of sustainability. All forms of growth are unsustainable, whether in the number of trees, people, great whales, and levels of atmospheric carbon (IV) oxide. However, to attain the MDGs, environment sustainability is urgent. Scholars has suggested that when a sets of quantifiable criteria has been satisfied, sustainability in building can be achieved. (Sherif & Carmela , 2019). As previously stated, the building industry has a major role to play, in planning and executing these design and construction principles in making the environment sustainable for habitation.

2.4 Planning Role and its Relationship with Building Regulation

Local and neighbourhood plans set the context for new development. They contain policies which outline the local planning authority's objectives for its region, the main locations for development and the key criteria against which development proposals will be considered.

- Planning has an important role in encouraging and facilitating buildings that meet high standards of environmental sustainability, in support of its statutory objective to contribute to the achievement of sustainable development. The NPPF states that local planning authorities should plan for new development in locations and ways which reduce greenhouse gas emissions and actively support energy efficiency improvements to existing buildings.
- The Building Regulations set minimum standards in relation to a number of sustainability issues, such as energy efficiency and water consumption, as well as matters such as structural soundness. For housing, the Government has adopted the Code

for Sustainable Homes as a way of signposting the long-term direction of travel on sustainable design and construction. The Government-owned Code encourages a voluntary progress beyond minimum standards and promotes innovation and change in the construction industry. It is worth noting that some standards provide fixed ratings that do not change significantly over time, while others are routinely updated. This can be important when deciding what level to specify in planning policy.

- Technology, materials and the Building Regulations regime will continue to evolve in the future. There will be instances where it will be suitable for local planning authorities to expect levels of building sustainability in advance of those set out nationally. These could include, for example, where:
  i. there are clear chances for major use of decentralised and renewable energy or a need to safeguard their potential future use; or
  ii. local conditions, such as high water stress, mean that development without high standards would be unacceptable for its proposed location; or
  iii. local indication shows that the effects of climate change will require adaptive measures in some buildings and homes.
- It is important to recognize that standards such as the Code for Sustainable Homes, while taking account of the Building Regulations, cover a significantly wider range of sustainability issues than is covered by regulation. The Code for Sustainable Homes addresses important sustainability issues such as materials, waste, health and well-being, ecology, and management of both the construction process and the completed building.

2.5 Formulating Planning Policies on Sustainable Design and Construction

When proposing any local requirements for sustainable buildings planning authorities must be able to demonstrate with clear robust evidence the circumstances that warrant this, focusing on local or site-specific opportunities and constraints. They should specify the requirement in a way consistent with the Government's zero carbon buildings

policy and adopt nationally described standards.

Schemes such as the Code are designed so that they can be applied as appropriate to local circumstances, while at the same time providing a consistent and widely understood national framework.

A significant advantage of using the Building Code and similar schemes is that they involve independent assessment and accreditation. For local planning authorities this means that they do not need to employ expert staff to assess a development's credentials, but are able to rely on a trained and licensed independent assessor. At the same time, developers and local communities can have confidence that a development is fairly assessed against objective criteria.

Policies on sustainable design and construction should be set out in a development plan document to ensure full consultation with the local community and other stakeholders and examination by the Planning Inspectorate. Such policies should focus on local opportunities and constraints whilst avoiding the repetition of nationally available information. Sustainable design and construction have an important role to play in helping to avoid increased vulnerability to the range of impacts arising from climate change and to manage risks through adaptation.

2.6 A Design Approach in Environmental Sustainability and Development

An approach to sustainable design for environmental sustainability in a building and for the community should:

i. Evaluate the building and look at the neighborhood, the street pattern settlement, urban form, walkability, accessibility, and livability.

ii. Understand the investment in the existing neighborhood, the site and building, economically, culturally, environmentally-in fact all definitions of energy investment.

iii. Understand the flexibility and adaptability of traditional building forms and fabric, and the advantages of their continuing use.

iv. Understand the structure, construction and materials, and the inherent climate control characteristics and dynamics of an older building.

v. Measure energy improvements and efficiency in the context of the original building, and not against the potential performance of a new building which would overlook the life cycle costs associated with demolition and new construction.

Sustainable design techniques are becoming increasingly important in building design. It should include all kinds of activities and processes that increase the capacity of people or the environment to meet human needs and improve the quality of human life. Many studies have been conducted on the principles of sustainable architecture. For this, the following studies by Park (1998), Reynolds (2000) and John et al., (2005) and Wetherill et al. (2007). Park (1998) believed that, "sustainable design encourages the use of natural and renewable materials, new technologies for control of energy use, materials and products that have a long life and can themselves be recycled, and materials that can efficiently be maintained and renewed."

Park (1998) summarizes four major principles of sustainable building design as follows;

• Provide a healthy environment for the workplace by providing good ventilation;

• Select building technologies and materials that are "green", such as using local materials.

• Consume less energy in the new systems in the building than market standards;

• Have a recycling plan for waste and water.

2.7 The Approaches and Principles of Environmental Sustainability

2.7.1 Energy Efficiency and Conservation

At the basic level, buildings offer shelter from the excesses of heat, cold, wind and rain, and ideally beyond that, a comfortable working or living environment, including adequate insulation and ventilation.

Buildings also account for the majority of our energy consumption. Energy use and efficiency are consequently significant concerns, whether measured in day to day running costs, or the costs to the global environment.

Traditional construction, design and materials rely upon a time-honored understanding and techniques of interior and exterior shelter and climate management and control. According to studies, "building shelter and shade are directly influenced by orientation, mature tree cover and landscape, and are also afforded by porches, stoops,

eaves and window reveals. Roof forms and building massing also have a role to play."

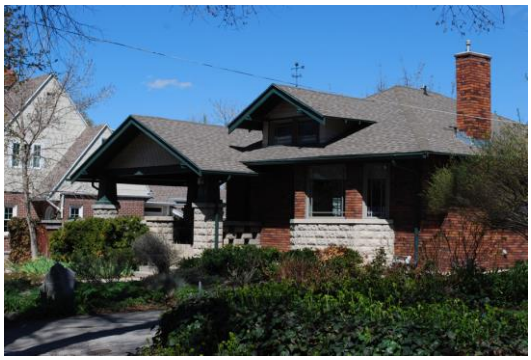

Figure 1. The architectural character of the building incorporates a variety of traditional design characteristics such as external porch, deep eaves, natural ventilation and solid masonry construction, ensuring efficient energy management and conservation.

Traditional wood, whether used as a cladding material, building structure or for sections of a masonry building, e.g. porches, windows, doors, fascia and eaves, is usually from old growth trees and milled to appropriate dimensions. With its tighter grain, it is a denser, tougher and more resilient material than the recently harvested wood currently available.

Interior room volumes and operable windows jointly play a notable role in interior climate control, natural ventilation and comfort, as well as ensuring a healthy circulation of fresh air. Coupled with low key mechanical intervention, such as ceiling fans, these assets can be employed to their maximum. Understanding how these characteristics and dynamics are designed to work will ensure that energy efficiency enhancement strategies are designed to be complementary, capitalizing on these advantages, while accentuating their attributes and efficiency.

2.7.2 Traditional Building Form and Construction

Knowledge and appreciation of the characteristics and performance of original building materials, details and craftsmanship in building maintenance, repairs and alterations will simultaneously achieve preservation, conservation and sustainability objectives. Older buildings, designed and constructed with integral advantages in passive internal climate control, have distinct characteristics which are inherently sustainable. Understanding these characteristics and dynamics makes sound scientific sense and this understanding is a prerequisite of maximizing energy conservation and efficiency.

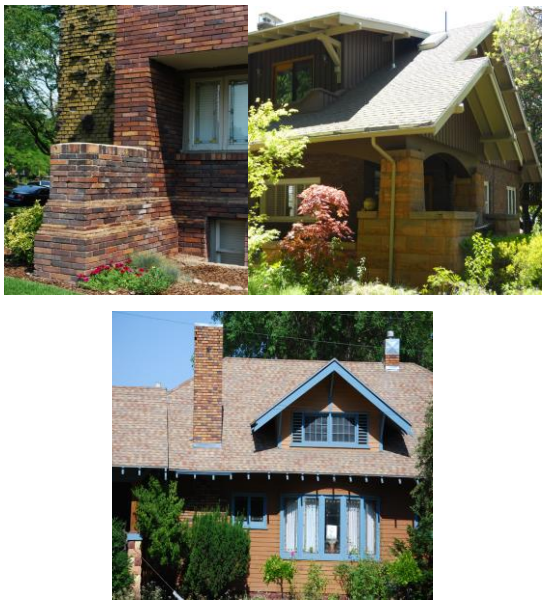

Figure 2. Historic masonry and recessed windows here combine natural materials, thermal mass and shade with natural ventilation to enhance energy conservation, management and efficiency, while creating some of the best examples of the city's historic architectural character.

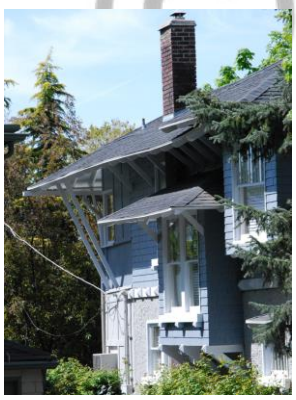

Figure 3. Projecting eaves provide protection from precipitation and solar exposure.

Ensure any external materials are allowed to breath.

Avoid sealing in moisture by over-cladding with new materials.

- Do not paint masonry which has not been painted and avoid sealants in most circumstances.
- Consider paint removal from masonry if it can be achieved with the necessary care to avoid damaging the masonry.

Most historic buildings have distinct energy efficient characteristics. Evaluate priorities for energy upgrades with these advantages informing the program of work. Similarly, work with the historic and architectural character of the building, site and setting when arriving at decisions on investing in renewable forms of energy generation.

With mature landscaping, retain and maintain trees, shrubs, ground cover and enhance where appropriate. In paved areas, maximize natural ground cover to absorb and retain water for subsequent use, and to avoid excess run off.

Consider the use of Solar Photovoltaic Paneling.

- These are now available as panels of differing sizes, solar laminates and shingles, and are adaptable to a variety of circumstances.
- With a roof mounted location choose a situation which will maximize

energy generation without adverse visual impact upon architectural character.

- Consider solar panel location on accessory buildings or in free standing arrays where they would adversely affect the character of the building.
- Avoid a situation which would prompt the removal of mature tree cover or vegetation, with their environmental advantages.
- Consider the impact of reflection upon neighboring buildings and streets.
- Consider options and configurations of a geothermal heat source in relation to ground conditions and site constraints.

2.7.3 Renewable Energy – Passive & Active

Renewable energy generation is a component of sustainable development which does not deplete natural resources or cause pollution in generating energy. Renewable energy sources can be both passive and active. While they are harnessed to provide large scale industrial and community energy, they also have a role to play at the more intimate scale of the individual building and in the form of development.

a. Passive Energy Management

Passive energy measures play a significant role in climate control, and can be as simple as heat absorbing materials, such as masonry, which absorb heat during a warmer day, releasing it through the cooler night. The effect works equally well providing a cooling effect in hot weather. The high density, temperature-capture and storage properties of masonry help to moderate extremes of heat and cold, and act as a passive energy source.

Window glass transfers both heat and cold, and can be a very effective source of interior solar heat gain in cold weather, reducing the burden on other mechanical systems. Operable windows also have passive energy generating and control characteristics in providing air circulation and ventilation. The double-hung sliding sash window in particular is designed to pull in cooler air below as it affords escape for warmer air above.

In a hot summer climate, shading a building to reduce solar gain will be critical. This can be achieved through situation, orientation, balconies or porches, fenestration and architectural shade elements. It can also be achieved using planting and tree cover,

where mature deciduous trees in particular provide the benefit of effective summer shading with reduced shade to permit greater solar gain in the colder winter months.

b. Active Renewable Energy Generation

Active renewable energy generation systems have been much studied, and have made significant technological strides in recent years.

Geothermal sources are perhaps the lower end of the technological spectrum. Circulating liquid at a specific depth below the ground surface can tap the constant temperature of the ground, both for residual heat and a residual cooling effect. Using heat exchangers, this type of system can notably reduce the burden on or need for heating and cooling systems. The concept behind **biomass** energy is that heat is created by the combustion of a fuel source which can be continually grown, or produced as waste, and although requiring more attention, it is also more immediately deployable when required.

Wind and water turbines have a long-standing historical pedigree, providing a source of power at both a small and a large scale. Smaller turbine units have been developed to deliver greater efficiency than their historic counterparts, and at a scale which can be deployed for an individual building, site or narrow water channel.

Solar collectors are either thermal, where the sun directly heats water in a closed grid, or photovoltaic, where the energy from the sun is converted to electricity through a series of chemical cells. Solar collectors for urban building use are usually in the form of panels, although becoming increasingly available in the form of smaller units, solar laminates and roofing shingles.

2.7.4 Landscape and Planting

- Retain mature landscape and trees, and configure building siting, layout, design and grading accordingly.
- Plant new street trees in the public right of way where these are missing.
- Plant new trees across the site. Choose species and situate to maximize seasonal shade in hot weather and solar gain in cold weather.

Maximize landscaped areas while minimizing utility areas.

- Where appropriate consider the roof areas of the building as part of the site landscaping, and energy and water management strategy.

Design landscaping and planting with a view to tempering excess heat or cold.

Design and choose plant varieties to allow for solar gain and ventilation.

- Design building footprint and landscaping to manage water in dispersed areas across the site, including swales and rain gardens.
- Choose indigenous plant species to maximize water conservation, and consider aspect and climatic extremes.
- Plan for communal/shared garden space/s.

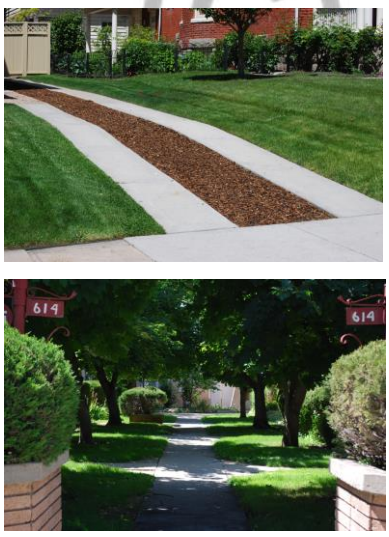

Figure 4. The landscaping of this historic garden apartment development combines cultural and environmental, sustainable development characteristics with a unique residential atmosphere.

a. Site Planning

Minimize site work that would adversely affect mature trees or disrupt mature layout and planting on this or adjacent sites.

- Retain historic or early site features and accessory structures.
- Maintain shading and shelter of the building and parking areas.
- Plan improvements to enhance shade and/or shelter as appropriate to complement climate control.

b. Building Design

Design the building to maximize passive energy management. Consider the following:

- Design the fenestration to take advantage of building aspect.
- Design to take advantage of the shading provided by aspect, window reveals, recessed entrances, canopies and awnings. Design windows to open for natural ventilation, interior atmosphere and a healthy living and working environment.

Building and window design that utilizes natural light and ventilation will lead to conserving electrical lighting energy, shaving peak electric loads, and reducing cooling and heating energy consumption.

Design to provide the shade afforded by the articulation of building facades and the depth of the eaves.

- Design for variable massing to create upper terrace outdoor spaces and landscaped areas.
- Provide porch and stoop semi-public/private shaded spaces for their climatic moderating advantages.
- Plan for external balcony space for each unit.
- Wherever feasible provide green roof cover to enhance temperature and water management, and ecological diversity.

Investigate roof type and potential maximum loadings to check suitability.

Consider color schemes with solar reflectivity as well as urban setting in mind.

Colours have physiological and psychological impacts on the human body and in addition to its aesthetic values, it plays a significant role in reducing and reflecting the solar radiation on the external walls.

Design with sustainable and durable materials.

- Evaluate the energy management advantages of the thermal mass of denser more durable materials.

Choose materials for their stability and low emissivity characteristics.

Avoid experimental or synthetic materials which have no track record of durability.

- Avoid experimental or synthetic materials which produce pollution or toxic waste in their manufacture or disposal, or create environmental damage or disfiguration in their extraction.

The importance role of architects and engineers in the building industry in protecting the environment has been mentioned by many authors. As a result of the increasing concerns about global climate change, there are increasing forces on professionals to design and construct buildings that more environmentally friendly and can resist the future changing weather. (Gann, 2003) While advocating on environmental sustainability, (Roaf, Crichton, & Nicol, 2005) asked the users and owners of buildings to wake up and have a responsibility to future-proof their own interests against the demands of climate change. Edwards (1996, xiv**)** states: "*Architects have a larger share of responsibility for the world's consumption of fossil fuel and global warming gas CO2 than any other group. The structures that*

architects and engineers design, the way buildings are sourced and how they adapt over time influence the use of fossil fuel and production of UK"

Similarly, many institutes and architects responded to the previous discussion about the role of architects in the creation of a sustainable society, for instance, World Congress of Architects (1993A) clarified that to minimize future poverty, and to restore already degraded environments, architects are challenged to lead the way into the new field of environmentally conscious architecture and sustainable development that translates the requirements of a practical global ecosystem into the built environment.

3.0 Conclusion and Recommendation

The Millennium Development Goals (MDGs) were set to be achieved by 2015. Unfortunately, most under-developed and developing nations are still struggling to achieve these goal. It has been difficult for these countries to achieve them because most of them share the same poor socio-economic and political instability, especially for a country like Nigeria where corruption has consumed the system and it is very unfortunate that the virus of corruption has been injected into all the oncoming generations. However, for the MDGs not to be a tall dream, all sectors of the country has a role to play. Ultimately, this paper has well elucidated the role of the construction industry in attaining the Millennium Development Goals. It has focused solely on the 7th goal which is "Environmental sustainability". For the construction industry to play their role successful, it is inevitable that planning has a role and related to formulating building regulations and policies that when implemented and executed promotes sustainable building practices, hence, working toward the attainment of the MDGs.

Therefore, to continue to deliver high level of functionality, environmental comfort, and beautiful surroundings through sustainable design and construction methods, raises the question that if architects and engineers work within the local climate context and respect the environment they would be effective in reducing the environmental impacts and provide a comfortable interior and exterior environment in a natural way that works with and harnesses the climate, hence, contributing to the attainment of the Millennium Development Goals.

References

Adedigba, A. (2017). *60 million Nigerians are Illeterates-Minister of Education.* Abuja: Premium Times Nigeria.

Aisha, A. A., Steve , C., & David , D. (2017, May 5). *SUSTAINABLE ARCHITECTURE AND URBAN DEVELOPMENT: A state of the Art*. Retrieved May 27, 2020, from https://www.researchgate.net/publication/316694076_SUSTAINABLE_ARCHITECTURE_AND_URBAN_DEVELOPMENT_A_STATE_OF_THE_ART Beckerman, W. (1994). "Sustainable development": Is it a useful Concept? *Environment Values*, 191-201.

Biswas, & Jayanta. (2018). *What is the definition of Environment*. Retrieved may 28, 2020, from http://www.researchgate.net

Bourguignon , F., Be´nassy-Que´re´, A., Dercon, S., Estache, A., Gunning, J., & Ravikanbur, R. (2008). Millennium Development Goals at midpoint: where do we stand and where do we need to go? *Brussels: European Commission;*. Retrieved May 22, 2020

Carrington , D. (2018). *Ozone hole recovery threatened by rise of paint*. Retrieved May 31, 2020, from https://www.dhushara.com/Biocrisis/18/5/ozone.Reduce%20to%20300%20dpi%20average%20quality%20-%20STANDARD%20COMPRESSION.pdf

Cross Sector Group on Sustainable Design and Construction. (2012, August). Good Practice Guidance: Sustainable Design and Construction. 5-6.

Daly, H. (1988). On sustainable development and national accounts. *In Economics Growth and Sustainable Environments 0 Collard, OW Pearce, 0 Ulph. New York: St. Martin's press*, 205 pp..

DONATUS , O. E., & JOSEPH , K. U. (2012). CHALLENGES AND PROSPECTS OF THE MILLENNIUM DEVELOPMENT GOALS (MDGS) IN NIGERIA. *GLOBAL JOURNAL OF SOCIAL SCIENCES*, 119-132.

E, L. (1993). Toward improved accounting for Environment. *An UN-STAT World Bank symposium* (p. 329pp). Washington.DC: World Bank.

Gann, D. (2003). trading places- sharing knoledge about enironmental building techniques. *R. Cole, Lorch, R., , ed. Building, culture and environment, informing local and global practices. UK: Blackwell*..

Goodland, R. (1995). The Concept of Environmental sustainability. *Annual Review of Ecology and Systematics, V. 26*, pg 6,.

Goodland, R. (n.d.). THE CONCEPT OF ENVIRONMENTAL SUSTAINABILITY. *Allllu. Rev. Ecol. Syst. 1995.26:1-24*, 18-20. Retrieved May 27, 2020, from http;//www.annualreviews.org

Hansen, A. (2018). *Ozone layer not recovering in lower latitudes*. Retrieved May 31, 2020, from https://newatlas.com/stratospheric-ozone-layer-not-recovering/53272/

Hensley, Jo Ellen, & Aguilar, A. (2011). Preservation Brief 3: Improving Energy Efficiency in Historic Buildings. Retrieved from http://www.nps.gov/tps/how-to-preserve/briefs/3-improveenergy-

Hicks , J. (1946.). Value and Capital. *Oxford: Clarendon 446pp*.

Kolawole , O. T., Adeigbe , K. Y., Zaggi , H. Y., & Owonibi , E. (2014). Millennium Development Goals (MDGs) in Nigeria: Issues and. *Global Journal of HUMAN-SOCIAL SCIENCE: C*.

Landrigan, P., Fuller, R., Acosta, N., Adeyi, O., Arnold, R., Basu, N., & Baldé, A. (2017). The lancet commission on pollution and health. *Lancet 391(10119):462–512*.

Marta , L., Bettina , B., & Ulrich , L. (2014). The Millennium Development Goals: Experiences, achievements and what's next.

Olotuah, A. (2009). Demystifying the Nigerian Urban Housing Question. *Inaugural Lecture Series 53 Delivered at The Federal University of Technology, Akure,*, pp. 35-36..

Park, & Sharon, C. (1991). *Preservation Brief 24: Heating, Ventilating, and Cooling Historic Buildings: Problems and Recommended Approaches*. Retrieved from http://www.nps.gov/tps/how-to-preserve/briefs/24-heatvent-

Park, S. (1998). sustainable design and historic preservation CRM.

Randers, J., & Meadow. (1992). Beyond the Limits: Global Collapse. 300 pp.

Raux, P., & Alexander, A. (2007). *Sustainable Building Materials*. Retrieved may 29, 2020, from http://www,sustainabledevelopment.com/manual11/chapter%203.pdf

Riobert , G. (1995). The Concept of Environmentl sustianabiity. *Environmental Department, The World Bank, Washington, DC 20433*.

Roaf, S., Crichton, D., & Nicol. (2005). Adapting buildings and cities for climate change: a 21st century survival guide, .Oxford.: Jordan Hill.

Rockström , J., Steffen , W., Noone , K., Persson , Å., Chapin , F., Lambin, E., & Lenton , T. (2018). A safe operating space for humanity. Nature 461:472–475.

S, E. S. (1991). *The environment as Capital.* New York: Columbia university Press.

Sherif , G., & Carmela , C. (2019, August 30). Integrating the Sustainable Development Goals in Building Projects. *Journal of sustainability Reseach*, 4. Retrieved from https://doi.org/10.20900/jsr20190010

UN Brundtland Commission, . (1987). Retrieved May 28, 2020, from Meaninig of sustainability: http://www.academiaimpact.un.org

Wetherill, M., Rezgui, Y., Boddy, S., & Cooper, G. (2007). Using knowledge management to inform sustainability in construction. *World Congress of Architects (1993) AIA/UIA Declaration of Interdependence for a Sustainable Future. Washington, D.C., USA: AIA Press. World Congress of Architects (1993A) The Architect's Handbook of Professional Practice. 1st Ed ed. Washington, D.C., U.*

WHO.. *MILLENIUM DEVELOPMENT GOAL*. Retrieved from World Health Organization: http://www.who.int/topics/millenium_development_goals/about/en/